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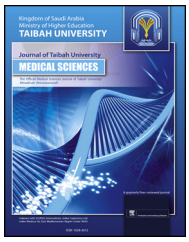

Educational Article

Effectiveness of case-based teaching of physiology for nursing students

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الملخص

أهداف البحث: يعتبر التعليم المعتمد على الحالة نهجا جديدا نسبيا في تعليم العلوم الأساسية. على الرغم من أن هذه الطريقة قد استخدمت في التعليم الطبي لعدد من السنوات، إلا أن هناك محاولات قليلة بذلت لدراسة فاعلية هذه الطريقة على طلاب التمريض. الهدف من هذه الدراسة هو مقارنة فاعلية الطريقة التعليمية التقليدية، بطريقة التعليم المعتمد على الحالات في تدريس علم وظائف الأعضاء بين طلاب السنة الثانية بكلية التمريض.

طرق البحث: أجريت دراسة وصفية بحيث كانت عينة الطلاب هي العينة الضابطة نفسها، بحيث أجري لهم امتحان بعد كل عملية تدريسية. في الأولى، درس الطلاب علم وظائف الأعضاء للجهاز الهضمي بالمحاضرات التقليدية. وفي الثانية، درس نفس الطلاب علم وظائف الأعضاء للجهاز البولي بواسطة نفس المدرس بطريقة التعليم المعتمد على الحالات. استخدمت طريقة الامتحان بالاختيار من متعدد بعد كل فترة تدريسية وتمت مقارنتهما. وبعد انتهاء الفترتين، قيم الطلاب الطريقتين بتعبئة استبانة. واستعمل التحليل الإحصائي لتحليل النتائج.

النتائج: كان أداء الطلاب بالامتحان بعد تدريسهم بالطريقة التقليدية أفضل إحصائياً من أدائهم بعد تدريسهم بطريقة التعليم المعتمد على الحالات. وقد عبر أكثر من ثلثي الطلاب عن تحسن معلوماتهم الطبية بطريقة التعليم المعتمد على الحالات مقارنة بالطريقة التقليدية بالمحاضرات.

الاستنتاجات: وجد أن الأداء في الامتحانات بعد التعليم عن طريق المحاضرات أفضل إحصائياً، ولكن التغذية الراجعة من الطلاب أشارت إلى أن التعليم المعتمد على الحالات يمكن استعماله بديلا عن المحاضرات وقد يساعد على التحصيل المهاري، الأمر الذي يعد مهما في حل المشاكل المهنية أثناء العناية التمريضية.

الكلمات المفتاحية: التعليم المعتمد على الحالات; محاضرة تعليمية; طالب التمريض

Abstract

Objectives: Case-based teaching is a relatively new approach to teaching basic sciences. Although this technique has been used in medical teaching for many years, few attempts have been made to examine its efficacy for nursing students. The aim of this study was to compare the effectiveness of didactic and case-based teaching of physiology among second-year nursing students at our college.

Methods: A descriptive cross-over study was conducted, in which the students served as their own controls, as they were examined after each of two sessions. In the first session, the students were taught digestive physiology by traditional lectures. In the second session, the same students were taught renal physiology by the same instructor using a case-based technique. Multiple-choice questions were used to assess each student's comprehension after each session and compared. At the end of the two sessions, students evaluated the teaching method on a questionnaire. Paired *t* tests were used to analyse differences.

Results: The performance in tests was statistically significantly better after didactic lectures (mean, 17.53) than after case-based teaching (mean, 16.47) (two-tailed $p = 0.003$). However, 65–72% of students found that case-based teaching improved their knowledge about the topic better than lectures.

Conclusions: Significantly better examination performance was observed after didactic teaching, but the students' feedback indicated that case-based teaching could be used as an alternative to lectures and may facilitate skills acquisition, which is considered to be important in professional problem-solving during nursing care.

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Keywords: Case-based teaching; Didactic lecture; Nursing student

Introduction

Nurse educators struggle to find the best ways to prepare nursing students to care for patients in the increasingly complex health care environment. New nurses must be prepared to solve problems and think critically in order to provide high-quality care to patients, and they must be able to work collaboratively, analyse data, interpret results, think critically, draw reasoned conclusions and make complex decisions.[1] Early assessment and detection of declining health status and quick intervention are essential to a patient's recovery. Nurse educators assist their students in applying knowledge about nursing-related sciences and other disciplines to make independent decisions for comprehensive nursing care.[2,3] Preparing nursing students requires educators to use creative teaching strategies that engage the students in active learning, which increases their motivation, sharpens their thinking, deepens learning and strengthens collaboration in the classroom. In active learning, the higher thinking processes of students are stimulated.[4–6]

Conventionally, undergraduate students are taught in didactic lectures, practical exercises and tutorials, which are mainly passive teaching and learning methods and do not develop the problem-solving or reasoning skills of the students. Furthermore, there is hardly any involvement of students in the teaching–learning process. Although no single teaching method ensures a thorough understanding of a topic, various methods are being used in many institutes to reinforce lectures in teaching physiology, such as case-stimulated learning,[7] problem-based learning[8] and patient-centred learning.[9] In case-based learning, students are motivated to use clinical knowledge from real-life scenarios to solve problems. With this method, both students and faculty members contribute to discussions on identified learning issues.

Lectures are definitely a powerful method of delivering information to a large number of students quickly, but there has always been a need for an alternative to the traditional format in basic sciences education.[10–12] Case-based teaching is commonly used in medical and other health sciences courses, and has been used recently in nursing education.[10,11,13,14] Real cases that nurses might encounter in hospital are used to practice and apply basic scientific concepts in making clinical decisions and thinking critically in a patient-care scenario. By discussing a clinical case related to the topic taught, students understand the concept at a high order of cognition. This process encourages active learning and may have a more productive outcome.[5,15]

Another issue in teaching strategies is the monotony of lectures. Usually, the concentration level of students starts falling 10–20 min after the start of a lecture and improves slightly towards the end.[16,17] Some students like lectures, because the information is precise, to the point and all they have to do is listen. Didactic teaching remains the main teaching mode in many institutions, whereas various active learning methods, such as case-based, problem-based and team-based teaching and small group discussions, could also be used.

Despite numerous studies on case-based learning in various disciplines,[10,11,13,14] there is still not enough evidence of the efficiency of this method for undergraduate nursing students, as the results of the studies are diverse.[10,12,18–20] The purpose of present study was to determine any difference in the effect of lectures and case-based teaching on students' performance in examinations and to test whether nursing students found case-based teaching more enjoyable and more educationally stimulating than traditional lectures. To our knowledge, this is the first study to compare the effectiveness of case-based with didactic teaching for nursing undergraduate students in Kingdom of Saudi Arabia.

Materials and Methods

We conducted a descriptive cross-over study, in which the same students were their own controls, in the physiology department of our university in 2013. Nursing students enrolled in second-year anatomy and physiology at the nursing college were the study population. Of 96 students, 86 participated in the study.

The study protocol was approved by the ethics committee, and each participant gave informed consent.

The students were taught physiology in two sessions. In the first session, the instructor gave 5 h of lectures on digestive physiology, followed by a 2-h tutorial. The students' understanding of the topic was assessed from a multiple-choice questionnaire. For the second session, five case-based lectures on renal physiology were prepared and reviewed by a committee including a person from the nursing department. In this session, the same instructor used the case-based method over 5 h. Each session started with a case, followed by a 25-min student discussion about the physiology of the case. During the next 25 min, the instructor explained the concept, followed by a wrap-up session. This session was followed by a 2-h case-based tutorial with some prepared exploratory questions related to the case to be discussed in the group. The teachers were asked to address all the relevant points that came up in discussion prompts. At the end of the session, the students' understanding of the topic was assessed from a multiple-choice questionnaire, in which 30% of the questions tested cognitive skills from the case-based scenarios. To avoid any bias in the instructor's evaluation of performance, the instructor was unaware of which teaching method had been used.

After completion of each of these two teaching sessions, the students filled in a feedback form after the examination, to determine whether they agreed with 12 statements about the teaching method used on a five-point Likert scale. Examples of the statements are: "The case-based study is more helpful for understanding the topic than lectures." "This course helped me to improve my ability to think and solve problems rather than just memorize information." "This case-based course helped me to improve my understanding of the questions on the examination and to answer the quiz easily." The feedback form was developed from the National Commission for Academic Accreditation and Assessment

(Kingdom of Saudi Arabia) course evaluation survey,[21] which can be provided upon request.

Statistical analysis

The data were analysed with SPSS software package version 19.0. Descriptive statistics were used to analyse the students' responses regarding case-based verses didactic teaching. Students' feedback on the teaching strategies is expressed as percentages. Students' examination performance after lectures and after case-based teaching were analysed in a paired-sample t test. The level of significance was set at 0.05.

Results

The students performed statistically significantly better in examinations after lectures than after case-based teaching ($p = 0.003$; Table 1). With regard to student feedback, 71% found that case-based teaching improved their knowledge about the topic better than lectures. Of these, 68% found that case-based teaching was more useful for understanding the topic; 67% considered that the assignments, tutorials and laboratories in the case-based method were helpful for developing the knowledge and skills the course was intended to teach; 70% found case-based teaching helpful for thinking and developing their own ideas; and 69% considered that the case-based course would help them to apply their basic knowledge in a clinical situation. The time allotted for the course was considered sufficient to understand the content by 72%, and 65% found the course more interesting than lectures and asked that other topics be taught in the same way.

Discussion

The results of this study indicate that the knowledge of students is not significantly improved by this new teaching method, as their examination performance was better with the didactic method. Other studies reported better performance after case-based teaching[18–20] or similar efficacy.[10,17] Tayem[22] found better student performance after case-based than didactic teaching in a study to determine students' perceptions of incorporating small group case-based learning into traditional pharmacology lectures. Although we found a significant increase in our students' performance after lectures, the students' satisfaction questionnaire showed that they preferred independent learning.

Dupuis and Persky[23] compared three methods for teaching clinical pharmacokinetics: case-based learning in small groups, a more traditional style of teaching and case-based learning in large groups. Students' satisfaction and examination performance were better in the small case-based format. Abraham et al.[18] found that students taught by lectures performed better on examinations than the control group, and feedback from the students indicated that they preferred lectures. They expressed frustration with case-based learning, including confusion of faculty–student expectations, insufficient faculty, student tutorials and self-directed learning strategies, lack of integration into the curriculum and insufficient time. In our study population, the students found that the case-based method followed the course outline, which the time allotted was sufficient to learn and the assignments and tutorials were interesting. Thus, our results were different from those of Abraham et al.

Kawai et al.,[24] Kaddoura,[25] Flanagan et al.,[26] Tiwari et al.,[8] and Hsu[27] used a combination of Likert scales and questionnaires to investigate student feedback. These showed that most students enjoyed case-based teaching and considered that their clinical reasoning, diagnostic interpretation and ability to think logically were improved. One advantage of this teaching strategy is that students have the opportunity to perform in-depth analyses and apply critical thinking to realistic, complex patient care situations in a safe environment. The results of our study show that undergraduate nursing students preferred interactive case-based discussions to traditional lectures in physiology, although their examination performance was not enhanced by this strategy. A probable reason is that this was their first exposure to this type of teaching. Furthermore, their knowledge was tested 1 month after the lectures, and it is not known whether it was retained years later. Furthermore, only factual multiple-choice questionnaires were used to check retention of knowledge after lectures, whereas questionnaires that tested cognitive skills were incorporated for evaluating case-based teaching. Although traditional lectures convey factual information well, they are not well suited to higher levels of learning, such as critical thinking, analysis and problem-solving, which must be learnt by doing.

Table 1: Examination performance of 86 nursing students after two teaching methods.

Teaching method	Mean	SD	SEM	p
Didactic	17.53	3.58	0.38	0.003
Case-based	16.47	3.69	0.39	

SD, standard deviation; SEM, standard error of mean.

Strengths and limitations

The individual teacher's qualities play a crucial role in the learning experience and in the teaching strategy they use. However, we specifically attempted to address the effects of the teaching strategy rather than the teacher. This was achieved by the cross-over design, with the same teacher delivering both teaching styles to the same group of student.

Limitations of this study include the fact that different concepts were taught by the two methods, and students may find digestive physiology easier to understand than renal physiology. Furthermore, the resource and economic implications of the two teaching methods were not addressed in this study.

Conclusions

Although a significant difference in examination performance was observed between didactic and case-based teaching, the students' feedback indicated that case-based teaching could be used as alternative to lecture-based teaching. This study shows that undergraduate nursing students find interactive case discussions more enjoyable and

educationally stimulating than lectures. Therefore, case-based teaching should be considered in nursing, in preference to traditional teaching strategies, in order to make the basic sciences courses and especially physiology more attractive and palatable. A multi-stage assessment of changes in student perceptions would be more reliable for measuring students' attitudes to course restructuring.

Conflict of interest

The author reports no financial or other conflict of interest pertaining to the subjects or products discussed in this article. This research received no specific grant from any funding agency in the public, commercial or non-profit sector.

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